REMARKS

This Response is responsive to the Office Action mailed March 12, 2003. In that Office Action, the Examiner rejected claims 1-18 under 35 U.S.C. §103(a) as being unpatentable over Kumar et al., U.S. Patent No. 6,204,852 ("Kumar") in view of Schick et al., U.S. Patent No. 6,175,647 ("Schick"). With this Response, the Applicants respectfully traverse the rejection of claims 1-18. It is believed that all claims are in a condition for allowance. Notice to that effect is respectfully requested.

Claim Rejections under 35 U.S.C. § 103

Claims 1-18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kumar et al., U.S. Patent No. 6,204,852 ("Kumar") in view of Schick et al., U.S. Patent No. 6,175,647 ("Schick"). Independent claim 1 is directed to an apparatus for sensing three-dimensional movement and includes the limitations a "movable" motion sensor, and specifies that the movement data generated by the sensor is "indicative of motion of the sensor in three dimensions." In contrast, as the Examiner acknowledged, "Kumar et al discloses an arrangement in which 3D position and motion information is obtained using a stationary sensor (the cameras) . . . ." (Office Action at para. no. 2, page 2). However, the Examiner stated that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to exchange the arrangement of Kumar et al for the arrangement of Schick et al as desired because they both generate 3D position information based on the *relative* movement of a sensor and a reference object for providing a far-field image. (Office Action at para. no. 2, pages 2-3) (emphasis in original).

There is no teaching or suggestion to combine Kumar and Schick. The system disclosed in Kumar is specifically designed to use carefully calibrated stationary cameras to determine the absolute 3D position of a finger. (See, e.g., Kumar at col. 6, line 18, to col. 8, line 35). Kumar discloses that a "complex" camera calibration must be performed, including determining the camera's absolute position and orientation (i.e., the position and orientation with respect to a user-defined "real world" coordinate system). (See, e.g., Kumar at col. 6, lines 18-53). There is no teaching or suggestion in Kumar to modify or convert the cameras disclosed therein into a movable motion sensor. To do so would render meaningless the camera calibration technique disclosed in Kumar. There is no teaching or suggestion in

Kumar regarding a movable motion sensor that generates movement data indicative of motion of the sensor in three dimensions as claimed in independent claim 1.

Similarly, Schick teaches away from using a system like that disclosed in Kumar that uses stationary cameras. Schick discloses that "[a] significant disadvantage of this online system is that the cameras have to be constructed such that they are stable and stationary at all times, and that the cameras permit only a limited volume to be measured, specifically only the area which is covered at least by two cameras." (Schick at col. 1, line 65, to col. 2, line 2).

Schick discloses that:

> The surface points to be measured of the object 1 are mechanically touched by the probe tip 7. The cameras 5 fastened rigidly to the probe 4 are oriented toward the target area 2 and hence to the reference points 3 thereof, and serve for determining the spatial position of the probe tip 7 at the instant of touching with respect to the target area 2 in terms of the reference system 3. The computer 6 evaluates the images communicated from the cameras 5 and, with the aid of a corresponding calculation program, determines the 3D coordinates of the probe tip 7 and thus of the respective measurement point. (Schick at col. 4, lines 21-32).

Thus, Schick discloses a system for measuring the 3D spatial **position** of surface points on an object 1 using a movable probe 4. There is no teaching or suggestion in Schick that the probe 4 generates movement data indicative of motion of the probe 4 in three dimensions. There is no teaching or suggestion in Schick regarding a movable motion sensor that generates movement data indicative of motion of the sensor in three dimensions as claimed in independent claim 1.

In view of the above, independent claim 1 is not taught or suggested by Kumar and Schick, either alone, or in combination. In addition, dependent claims 2-7, which further limit patentably distinct claim 1, are also believed to be allowable over the cited references. Allowance of claims 1-7 is respectfully requested.

Independent claim 8 is directed to a method of sensing relative three-dimensional movement, and includes the limitation "generating a set of motion data based on the correlation indicative of relative motion in three dimensions of the first and the second arrays." As described above with reference to claim 1, there is no teaching or suggestion to combine Kumar and Schick. There is also no teaching or suggestion in Kumar regarding

generating motion data indicative of relative motion in three dimensions of a first and a second two-dimensional array of photo detectors. Schick teaches a system for identifying 3D spatial positions of an object being measured, but does not teach or suggest generating motion data indicative of relative motion in three dimensions of a first and a second two-dimensional array of photo detectors.

With respect to claim 8, the Examiner stated that:

> Kumar et al does not disclose that subsequent sets of digital representations of images captured by the first and the second cameras are correlated to yield motion data. However, Kumar et al. does disclose that three-dimensional position coordinates and orientation angles are tracked (column 5, line 66 to column 6, line 5), implying that they are followed or related over time. It is well known to correlate subsequently obtained digital images to generate relative motion information. It would have been obvious to one of ordinary skill in the art at the time of the invention to include a correlation step to aid in the tracking of the three-dimensional motion of a user's hand in order to obtain more accurate relative motion information. (Office Action at para. no. 2, page 3).

As the Examiner appears to acknowledge, Kumar does not teach or suggest the step in claim 8 of "correlating digital representations in the first set with digital representations in the second set." Since Kumar does not teach or suggest this correlation step, it follows that Kumar also does not teach or suggest the step of "generating a set of motion data **based on the correlation** indicative of relative motion in three dimensions of the first and the second arrays." (emphasis added). Likewise, Schick also does not teach or suggest "correlating digital representations in the first set with digital representations in the second set" or "generating a set of motion data based on the correlation indicative of relative motion in three dimensions of the first and the second arrays." The Applicants respectfully request in accordance with M.P.E.P. § 2144.03 that the Examiner cite a reference to teach the further limitations of claim 8, of which the Examiner appears to be taking Official Notice.

In view of the above, independent claim 8 is not taught or suggested by Kumar and Schick, either alone, or in combination. In addition, dependent claims 9-14, which further limit patentably distinct claim 8, are also believed to be allowable over the cited references. Allowance of claims 8-14 is respectfully requested.

Independent claim 15 is directed to an apparatus for sensing three-dimensional relative movement, and includes the limitation "a controller . . . configured to . . . generate movement data based on the digital representations of the far-field images, the movement data indicative of motion of the first and the second arrays in three dimensions." As described above with reference to claims 1 and 8, there is no teaching or suggestion to combine Kumar and Schick. There is also no teaching or suggestion in Kumar regarding generating movement data indicative of motion of a first and a second two-dimensional array of photo detectors in three dimensions. Schick teaches a system for identifying 3D spatial positions of an object being measured, but does not teach or suggest generating movement data indicative of motion of a first and a second two-dimensional array of photo detectors in three dimensions.

Further, claim 15 includes the limitation that the first and the second two-dimensional arrays of photo detectors are "constructed in a substantially perpendicular arrangement." The Examiner did not address this limitation with respect to claim 15, but did state with respect to claims 6-7 and 12-13 that:

> Kumar et al discloses cameras that are oriented at an angle to one another (Figs. 1 and 5). Kumar et al does not disclose that the cameras are oriented perpendicularly. It would have been obvious to one of ordinary skill in the art at the time of invention to orient the cameras perpendicularly depending on the location and dimension of the specific zone to be monitored. (Office Action at para. no. 2, page 4).

However, unlike Kumar, claim 15 is not directed to a system that uses stationary cameras that are permanently positioned to monitor a specific zone. Rather, claim 15 specifies that the generated movement data is indicative of "motion" of the first and the second arrays of photo detectors in three dimensions. Neither Kumar nor Schick discloses movable arrays of photo detectors with the arrays "constructed in a substantially perpendicular arrangement." The Applicants respectfully request in accordance with M.P.E.P. § 2144.03 that the Examiner cite a reference to teach the further limitations of claim 15, of which the Examiner appears to be taking Official Notice.

In view of the above, independent claim 15 is not taught or suggested by Kumar and Schick, either alone, or in combination. In addition, dependent claims 16-18, which further

limit patentably distinct claim 15, are also believed to be allowable over the cited references. Allowance of claims 15-18 is respectfully requested.

Allowable Subject Matter

In light of the above, Applicant believes independent claims 1, 8, and 16, and the claims depending therefrom, are in condition for allowance. Allowance of these claims is respectfully requested.

CONCLUSION

Any inquiry regarding this Amendment and Response should be directed to Jeff A. Holmen at the below-listed telephone number or Pamela Lau Kee at Telephone No. (408) 553-3059, Facsimile No. (408) 553-3063. In addition, all correspondence should continue to be directed to the following address:

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CERTIFICATE UNDER 37 C.F.R. 1.8: The undersigned hereby certifies that this paper or papers, as described herein, are being deposited in the United States Postal Service, as first class mail, in an envelope address to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 11th day of June, 2003.

By
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